

A RAND NOTE

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ANALYSIS OF YOUTH COHORT ENLISTMENT
INTENTION DATA:
PROGRESS REPORT

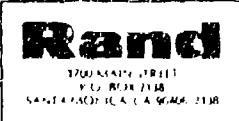
Bruce R. Orvis

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This Note documents a briefing on research investigating the relationship between survey data and respondents' subsequent enlistment decisions, attrition rates, and AFQT scores. The work should help identify possible applications of survey information in recruiting, aggregate enlistment forecasting, and as an outcome measure in policy option tests. AFQT, enlistment, attrition, and promotion information was linked with demographic and enlistment intention information for Youth Attitude Tracking Study (YATS) survey respondents. The intention information also was aggregated and matched with regional enlistment and economic data. The results indicate that enlistment intention information allows better prediction of YATS respondents' enlistment decisions and helps to predict attrition. They further suggest that AFQT category can be estimated statistically. Finally, preliminary analyses support a significant relationship between regional enlistment rates and concurrent regional enlistment intention levels. Future work should estimate these effects more precisely and investigate the extent of lagged effects.

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PREFACE

This Note documents a progress report briefing on Rand research into the validity and usefulness of survey measures of enlistment intentions. The work was performed under Rand's Manpower Policy Research Center for the Office of the Assistant Secretary of Defense (Manpower, Installations, and Logistics). The purpose of the research is to investigate the relationship between survey enlistment intention measures and respondents' subsequent enlistment decisions; to assess the usefulness of adding intention variables to individual and aggregate models based on demographic and economic factors, including both enlistment models and individual models of first-term performance; and to develop methods of identifying the quality of survey respondents who have not taken the Armed Services Vocational Aptitude Battery.

To accomplish these objectives, Armed Forces Qualification Test score, enlistment, attrition, and promotion information for Youth Attitude Tracking Study (YATS) respondents who tested for or enlisted in the military was linked with demographic and enlistment intention information from the YATS surveys. In addition, the intention information was aggregated and matched with regional enlistment and economic information. The work should help to identify possible applications of survey information in targeting recruiting efforts, in aggregate enlistment forecasting, and as an outcome measure of effectiveness in policy option tests. The briefing was given to the Joint Market Analysis and Research Committee (JMARC) during its November 1983 meeting.



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SUMMARY

Several U.S. youth surveys ask respondents about their likelihood of entering military service. The questions may address propensity for the military in general or intention to join a particular service. The information is used in a variety of ways--for example, to help forecast enlistment rates or explain differences in enlistment rates across geographic areas. These applications of enlistment intention data presume a direct relationship between the strength of a person's intention to serve and the likelihood of actually enlisting. Yet, there has been little systematic research to evaluate the validity of this assumption.

The purpose of the work reported here is to determine the extent of the relationship between intentions and enlistments, to assess the potential usefulness of adding intention information to enlistment and first-term performance models based on individuals' demographic characteristics, to develop methods of identifying the quality of survey respondents who have not taken the Armed Services Vocational Aptitude Battery (ASVAB), and to investigate useful applications of intention data in aggregate enlistment projection models. The research should thus be helpful in identifying possible uses of enlistment intention information in targeting recruiting efforts and in forecasting enlistments, both in the near and longer terms.

To accomplish these objectives, Armed Forces Qualification Test (AFQT) score, enlistment, attrition, and promotion information for Youth Attitude Tracking Study (YATS) respondents who tested for or enlisted in the military was linked with survey enlistment intention responses and demographic information from the YATS surveys. The survey data were drawn from the 12 waves of males interviewed between Spring 1976 and Fall 1982. The enlistment and first-term performance data were obtained from Defense Manpower Data Center (DMDC) extracts of Military Entrance Processing Station (MEPS) Reporting System records and active duty files. In addition, the survey intention information was aggregated and

matched with aggregated information on enlistments, economic factors, and recruiter levels. These composite data bases were then used to examine whether enlistment intention information is a significant factor in predicting enlistment and first-term performance.

This briefing summarizes the work conducted on the project in FY83. The results suggest that the enlistment intention measures in the YATS surveys do a good job of discriminating the respondent's true probability of enlisting and that the measures allow us to better predict the respondent's eventual enlistment decision than we can on the basis of his demographic characteristics alone. The results further suggest that the strength of a respondent's enlistment intention may be helpful in forecasting the likelihood that he will attrite if he does enlist. These results imply that enlistment intention information can be a useful addition to demographic information in distinguishing the types of individuals likely to enlist from those needing more persuasion and in predicting success in the military among enlistees. Therefore, the results suggest that enlistment intention information may be potentially useful in targeting recruiting efforts or allocating resources.

Work completed on developing methods of identifying the quality of YATS respondents has yielded encouraging results. In comparison with predictions based on the former YATS quality index, the analyses have substantially improved the correspondence between actual AFQT score and predicted AFQT score for the YATS respondents taking the ASVAB. Based on these results, it appears it will be possible to determine the quality of YATS respondents statistically, in a meaningful way.

Finally, preliminary work on adding intention data to aggregate enlistment forecasting models has provided evidence of a significant relationship between regional differences in average enlistment intention level and regional differences in enlistment rates. Thus, enlistment intention information may be a useful addition to such models. Further work is needed to estimate the relationship more precisely and to investigate the degree of any lagged effects of intentions on enlistments. If lagged effects are identified, intention measures may be useful in forecasting upcoming changes in enlistment rates and in assessing downstream effects of policy changes currently being tested.

ACKNOWLEDGMENTS

I am grateful to my Rand colleagues James Hosek and Michael Polich for their valuable advice in preparing this briefing, and to Richard Buddin and Alisa Wilson for their assistance in analyzing the results presented. I am also indebted to Dr. G. Thomas Sicilia, Director, and Captain Louise Wilmot, Deputy Director, Accession Policy, OASD (MIL), and to Dr. Zahava D. Doering, Chief, Survey and Market Analysis Division, Defense Manpower Data Center (DMDC), for their advice and support. Thanks must also go to Helen Hagan, who merged the intention and enlistment information, and to Les Willis and Robert Brandewie, who answered my questions with precision and patience, all of DMDC. Finally, a great deal of credit goes to Linda Daly and Jan Iverson, who assisted in the preparation of this Note and the briefing charts contained herein.

ANALYSIS OF YOUTH COHORT ENLISTMENT INTENTION DATA: PROGRESS REPORT

**Bruce R. Orvis
November 1983**

**The Rand Corporation
Santa Monica, California**

CHART 1

RESEARCH AGENDA

- Compare enlistment intentions with enlistment decisions
 - Do intentions predict actions?
 - Which intention measures work best?
- Investigate effects of enlistment intention information in analyses based on individual characteristics: enlistment, attrition, promotion
 - Identify possible uses of intention information in targeting potential recruits
 - Verify meaningfulness of relationships at individual level before performing aggregate analyses
- Develop methods of identifying quality of YATS respondents
 - Permit analysis of YATS results by quality level
 - Provide appropriate comparison group for forecasting high quality enlistments
- Assess contribution of enlistment intention results to aggregate enlistment forecasts

This briefing presents a progress report on the Rand analysis of youth cohort enlistment intention data. The analysis is based primarily on results from males interviewed in the Youth Attitude Tracking Study (YATS). We began work in the second half of FY82, with some basic objectives and questions in mind. First, we sought to follow up the YATS respondents to determine their actual enlistment decisions. We compared these enlistment decisions with the strength of the enlistment intentions the respondents expressed in the survey, to determine if their intentions were carried out. This included two basic questions. First, are respondents who say they will enlist more likely to do so than those who say they will not enlist? Second, which intention measures work best? In addressing the second issue, we were mindful that some measures may be preferable for certain purposes, whereas others may be preferable for other purposes. For example, certain measures may be better for predicting DoD-wide enlistments, whereas

others may be better for predicting enlistments in the specific services.

Results from this early work are shown in the next few charts. They indicate that there is a strong relationship between the intentions expressed in the survey and the respondents' actual enlistment decisions. In this year's work, we built on the earlier results by continuing our research in several areas. First, we sought to investigate the effects of enlistment intention information in analyses based on individual characteristics. These include analyses of the enlistment decision, and for those YATS respondents who enlisted, analyses of first-term performance as assessed by attrition and promotion. In conducting these types of analyses, we are asking whether knowing an individual's enlistment intention allows us to better predict his eventual enlistment decision or his first-term performance than we can on the basis of his demographic characteristics alone. That is, even though we may find a strong relationship between enlistment intentions and actions, it could be the case nonetheless that the intention information is captured entirely by a person's demographic characteristics, and that knowing his enlistment intention adds no further information. On the other hand, it may be that the enlistment intention information adds to our ability to predict his enlistment decision or first-term performance. In the latter case, the intention information becomes potentially useful in helping us target recruiting efforts. A second purpose of undertaking this type of analysis is to verify the meaningfulness of the relationship between intentions and enlistment at the individual level before we perform aggregate analyses. In aggregate analyses, the question we ask is somewhat different: whether knowing differences in the average enlistment intention level across regions can help us predict or explain differences in enlistment rates across those regions.

A second focus of this year's work has been to develop methods of identifying the quality of the YATS respondents. There is a quality index that has been previously used in the YATS, but it suffers from several problems. Most notably, the relationship between that ten-point quality index and the Armed Forces Qualification Test (AFQT) score is not as strong as it could be for analysis purposes. We are

attempting to develop an improved quality measure to permit us to analyze the YATS results by quality level. In addition, identifying a good quality measure in the YATS allows us to provide the appropriate comparison group for forecasting high quality enlistments. That is, if we want to look at the relationship between intentions and enlistments at the aggregate level for high quality individuals, we need both high quality enlistment counts and intention information for high quality YATS respondents.

Finally, in this year's work we have begun to assess the potential contribution of enlistment intention information to aggregate enlistment forecasting. As noted, this type of analysis asks whether knowing differences in the average intention level for different regions helps to explain or predict differences in the enlistment rates for these regions.

CHART 2

DATA BASES

- **Youth Attitude Tracking Study (YATS); 12 surveys, 1976-1982, NPS males ages 16-21**
 - Respondents matched with MEPCOM enlistment records through December 1982 (N=40,993)
 - Enlistees matched with attrition and promotion records (N=3102)
 - Statewide aggregate enlistment data matched with intention data (15 states, 58 months)

As I noted earlier, the results presented in this briefing are drawn from the Youth Attitude Tracking Study, or YATS.¹ We have analyzed data from 12 survey waves of the YATS, covering the period Spring 1976 through Fall 1982. These data were collected from randomly selected nonprior service males ages 16 to 21.² We have created three data bases from the YATS results to conduct our analyses. To analyze the enlistment decisions of the respondents, we combined their survey information with Military Enlistment Processing Command (MEPCOM) records of enlistments through the end of December 1982. This matching was done

¹The YATS survey is a DoD-sponsored telephone interview containing approximately 150 questions; the items assess demographic information, enlistment intentions, job goals, and recall of advertising promoting military service.

²Beginning with the Fall 1980 wave, women were included in the YATS surveys. Because the number of women surveyed is small and the post-survey follow-up period is very short, the analyses described in this briefing were performed for men only.

for approximately 41,000 YATS respondents.³ To analyze attrition and promotion for the subset of 3,100 YATS respondents who enlisted, we matched their survey information with the services' records of attrition and promotion. Finally, to analyze the effect of enlistment intentions at the aggregate level, we combined survey information with information on high quality enlistments for the 15 largest states over a period of 58 months between 1976 and 1981.

³These individuals represent the 70 percent of YATS respondents with Social Security Numbers (SSNs). Although the available data cannot resolve the bias issue with certainty, they suggest that the results presented would be comparable for the no SSN group, i.e., that no bias exists.

CHART 3

COMPOSITE INTENTION MEASURE DEVELOPED IN STUDY

- What do you think you might be doing (in the next few years)?
- How likely is it that you will be serving in the military (in the next few years)?

Unaided mention and definite intention

Unaided mention and probable intention

Positive propensity, no unaided mention

Negative propensity

We begin with a brief overview of work completed in FY82, which set the stage for this year's effort. We found that of the many intention measures in the YATS, a combination of two of them did a particularly good job of tracking individuals' enlistment decisions. The first measure is the unaided mention question. That question asks the respondent what he thinks he might be doing in the next few years. If he says he will join the military, he is considered to have an unaided mention of plans for military service. The second measure asks the respondent specifically about the strength of his intention to enlist. That question asks how likely it is that he will be serving in the military in the next few years. The respondent replies "definitely," "probably," "probably not," or "definitely not"; in the rare instance when he cannot decide, he indicates "don't know." In combining the responses to these questions, we form a composite measure with four categories. Persons in the first or most positive category are individuals with an unaided mention and a definite intention. These are

persons who said they would be joining the military when asked about their plans for the next few years, and who said they definitely intended to join when they were asked specifically about the strength of their intention to serve. Persons in the second category are individuals with an unaided mention who said they probably would join when asked about the strength of their intention to serve. Persons in the third category are individuals with a positive propensity toward serving in the military--that is, individuals who said they definitely or probably would serve--but who did not have an unaided mention of plans for military service. Finally, individuals in the fourth category are those with a negative enlistment propensity. These individuals indicated they would probably not or definitely not serve in the military. (The category also includes the small "don't know" group.)

CHART 4

**ENLISTMENT RATES FOR COMPOSITE
INTENTION MEASURE**
COMBINED YATS SURVEYS, SPRING 1976-SPRING 1978

Composite enlistment intention	Percent enlisting by December 1981	Percent testing by December 1981
Unaided mention and definite intention	49	62
Unaided mention and probable intention	32	48
Positive propensity, no unaided mention	15	25
Negative propensity	5	10

We followed up the respondents to determine their actual enlistment decisions. In this early work, the results are based on the first five waves of the YATS survey, covering Spring 1976 through Spring 1978, with the follow-up conducted through the end of December 1981. The follow-up, then, covers a period of three and a half to five and a half years, depending on the particular survey wave. As we will see in the next chart, to observe the full relationship between intentions and enlistments, we have to wait a fairly long time before conducting the follow-up.

Comparing the results for the different intention categories, we see a very strong relationship between intention level and both enlistment, as shown in the first column, and the percentage of individuals taking the written test within the follow-up period, as

shown in the second column.⁴ For example, nearly half of the persons in the most positive category, unaided mention and definite intention, enlisted by the end of the follow-up period. The enlistment rate drops to about one third of the persons in the unaided mention and probable intention category. Moving to the third category, we find that only about 15 percent of the persons with a positive propensity but no unaided mention enlisted during the follow-up period. Finally, for those with a negative propensity, the enlistment rate was only 5 percent. Similarly, looking at the right column of numbers, we see a strong relationship between the intention level and actual percentage of respondents who took the written test, ranging from just under two thirds for the unaided mention and definite intention category to about 10 percent for the negative propensity category. Comparing the numbers in the two columns, we see that the proportion of test-takers that enlisted was also strongly related to intention level, ranging from nearly 80 percent for the most positive category to 50 percent for the negative propensity category.

Two additional points are suggested by these results. First, the relationship between enlistment intention level and enlistment rate is relatively linear, at least for the positive categories. As we move from the unaided mention and definite intention category to the next category, unaided mention and probable intention, we observe a decrease in enlistments of 17 percentage points. Similarly, as we move down to the next category, positive propensity, no unaided mention, we see another decrease in enlistments of 17 percentage points. The decrease in enlistments between this third category and the negative propensity category is 10 percentage points. Thus, the decrease in enlistments is comparable as we move down from one category to the next, at least for the positive categories. The second point is that the third category, positive propensity, no unaided mention, may be particularly interesting

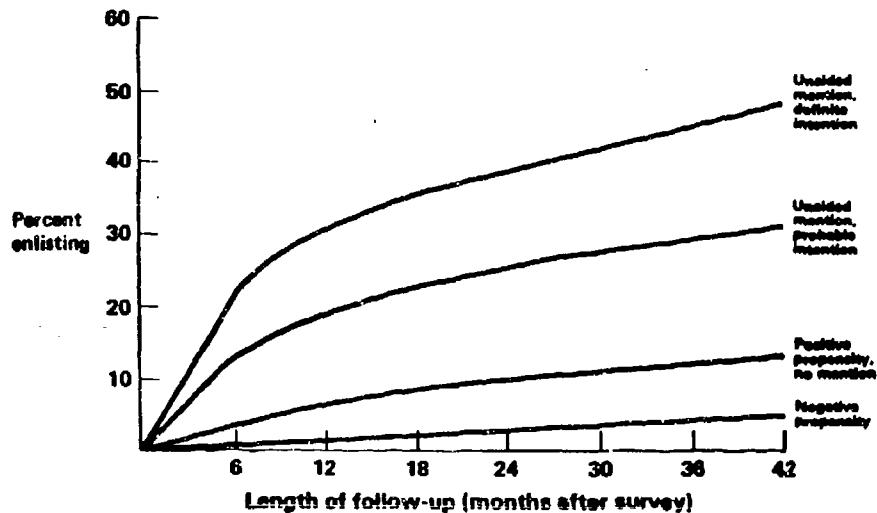
⁴This and subsequent analyses are unweighted and pertain to enlistments and written tests for the active duty Army, Navy, Air Force, and Marine Corps. Nearly all of the tests represent operational Armed Services Vocational Aptitude Batteries (ASVABs). Institutional ASVABs are included only if the respondent subsequently used the test to qualify for enlistment.

from the standpoint of recruiting. This category contains people who have expressed a positive propensity toward serving in the military and who represent nearly one quarter of the population.⁵ Nonetheless, as we see in the chart, the enlistment rate for this category is only 15 percent; in fact, only one quarter of these individuals took the written test.

⁵The four categories represent approximately 2 percent, 3 percent, 22 percent, and 73 percent of the combined YATS survey sample cohort in Chart 4.

CHART 5

**ENLISTMENT STATUS BY INTENTION OVER TIME
COMBINED YATS SURVEYS, SPRING 1976-SPRING 1978**



In this chart, we see why a long follow-up period is required to observe the full relationship between intentions and enlistments. The results shown represent the total or cumulative enlistment rate as we move out from the survey in six-month intervals, from six months following the survey to 42 months, or about three and a half years. The results are shown for the four intention categories we saw earlier. Note, first, that enlistments continue to increase throughout the entire period, that is, the curves continue to move upward. In fact, we must wait 12 to 18 months following the survey to observe even half of the eventual enlistments.

The chart also shows that using the intention measure to track enlistments over the long term is reasonable. The measure continues to discriminate differences in the enlistment rate by intention level throughout this entire period. The slopes of the four curves differ most in the initial 12 months or so following the survey; that is, the measure does the best job of discriminating differences in the enlistment rate over the initial year following the survey. However, the slopes of the curves remain different throughout the entire follow-up period. Thus, the measure continues to discriminate differences in the enlistment rate by intention level even three years after the survey.

CHART 6

TESTING STATUS BY INTENTION OVER TIME
COMBINED YATS SURVEYS, SPRING 1976-SPRING 1978

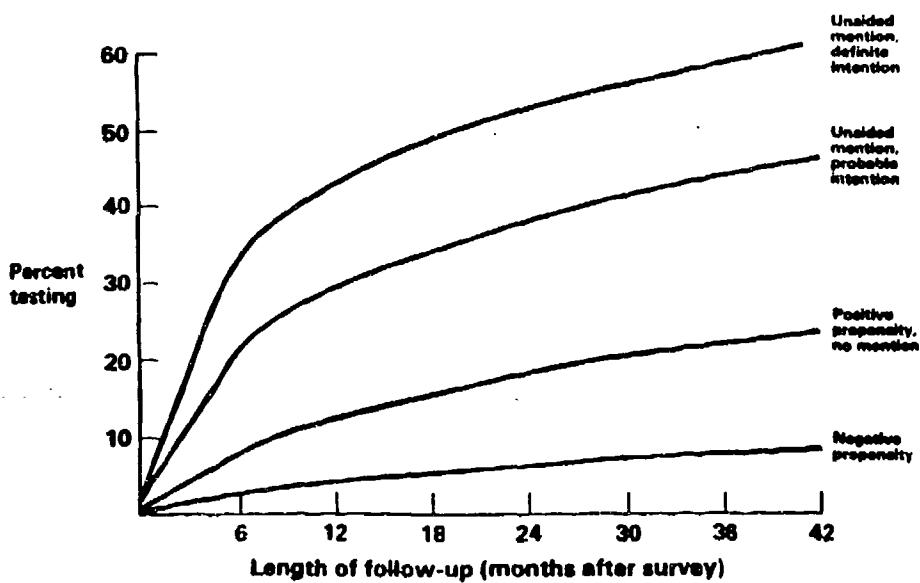


Chart 6 shows a corresponding analysis for the cumulative percentage of respondents taking the operational ASVAB following the survey, with similar results. Individuals continue to take the test over the long term, even three years after the survey. Also, while the measure appears to have its maximum discriminating capacity within the first 12 months or so following the survey, it continues to discriminate differences in examination rates for the different intention categories even three years after the survey.

CHART 7

**FACTORS USED IN ANALYZING EFFECTS OF
ENLISTMENT INTENTIONS FOR YATS RESPONDENTS**
(COMBINED YATS SURVEYS, SPRING 1976-SPRING 1979)

Enlistment Decision

- Enlistment intention
- Age
- Education status
- Academic courses and GPA
- Father's education
- Employment history
- Race
- Geographic region
- Recruiter contacts
- YATS survey wave

This year's work built on our earlier results, beginning with an analysis of whether knowing an individual's enlistment intention helps to predict his enlistment decision. As indicated earlier, despite the strong relationship between intentions and enlistments, it is possible that intention information is captured completely by an individual's demographic characteristics, and that knowing his enlistment intention adds nothing to our ability to predict his enlistment decision. To test whether or not this is the case, we combined the results for the first seven waves of the YATS survey, covering Spring 1976 through Spring 1979, and followed the respondents through the end of 1982 to determine their enlistment decisions. We then attempted to model the enlistment decisions based on the individuals' enlistment intentions and a variety of demographic information about the individuals contained in the survey.

The demographic factors used were those we expected would have an effect on an individual's enlistment decision. They include the respondent's age; his education status, including both whether he is a high school graduate and whether he is still in school; the math and science courses he has taken in high school and his self-reported grade point average; his father's education;⁶ his employment history, including whether he has a full-time job, whether he is looking for work, and his perceived difficulty of finding a full-time job; his race; his geographic region; his recruiter contacts, both lifetime and within the last six months; and his survey wave. We include the YATS survey wave because respondents in more recent waves have had less time to enlist and we need to adjust for that in the analysis.

⁶Some similar analyses have emphasized mother's education rather than father's education. Mother's education was not assessed in the early waves of the YATS; however, data from the 1981 Applicant Survey suggest that the two variables perform very similarly in enlistment models.

CHART 8

**FACTORS USED IN ANALYZING EFFECTS OF
ENLISTMENT INTENTIONS FOR YATS RESPONDENTS**
(COMBINED YATS SURVEYS, SPRING 1976-SPRING 1979)

Enlistment Decision

- Enlistment intention
- Age
- Education status
- Academic courses and GPA
- Father's education
- Employment history
- Race
- Geographic region
- Recruiter contacts
- YATS survey wave

Attrition, Promotion

- From YATS survey
 - Enlistment intention
 - Academic courses and GPA
 - Father's education
 - Employment history
 - Race
 - Recruiter contacts
 - YATS survey wave
- From accession records
 - Age
 - Education status
 - Geographic region
 - AFQT
 - DEP history
 - Service entered
 - Time in service

In analyzing attrition and promotion for the subset of YATS respondents who enlisted, we used many of the same variables used in looking at the enlistment decision. From the YATS survey, we again used information on the respondent's enlistment intention, academic courses and grade point average, father's education, employment history, race, recruiter contacts, and YATS survey wave. However, in this case we were able to use the services' accession records to update certain variables and to obtain additional information. In particular, we were able to update our information on the respondent's age, education status, and geographic region, using information at the accession point rather than at the survey point. In addition, we were able to obtain information on the respondent's AFQT score; his Delayed Entry Program (DEP) history, including both participation in DEP and length of time in DEP; the service he entered; and his time in service.

Before proceeding, we emphasize that our purpose in conducting these analyses is not to develop a final model of the enlistment decision or of first-term performance based on intentions and background characteristics. Rather, our purpose is to examine whether adding intention information to a reasonable list of demographic factors allows us to better forecast enlistment or first-term performance for YATS respondents than we can on the basis of their demographic characteristics alone.

CHART 9

**EFFECT OF ENLISTMENT INTENTION ON
ENLISTMENT DECISION**

(COMBINED YATS SURVEYS, SPRING 1976-SPRING 1979)

- Enlistment rate much higher for positive propensity groups

Propensity group	Increase in enlistment percentage*
Unaided mention, definite intention	36
Unaided mention, probable intention	23
Positive propensity, no unaided mention	7
Negative propensity	0

*Increase after controlling for demographic factors.

Our analysis compares the enlistment rate for each positive propensity group with the enlistment rate for the negative propensity group, controlling statistically for possible demographic differences between the members of the groups. The results show that the enlistment rate was much higher for each of the positive propensity groups than for the negative propensity group. As seen at the bottom of the chart, the enlistment rate for the unaided mention and definite intention group was 36 percentage points higher than the rate found for the negative propensity group, even after controlling for demographic differences between the respondents in the two groups. Similarly, the enlistment rate for the unaided mention and probable intention group was higher than the rate found for the negative propensity group by 23 percentage points. Finally, even the rate for the positive propensity, no unaided

mention group, the least positive of the upper three groups, was significantly higher than that found for negative propensity group, by some 7 percentage points.

CHART 10

**EFFECT OF ENLISTMENT INTENTION ON
ENLISTMENT DECISION**

(COMBINED YATS SURVEYS, SPRING 1976-SPRING 1979)

- Enlistment rate much higher for positive propensity groups
- Written testing rate much higher for positive propensity groups

Propensity group	Increase in enlistment percentage*	Increase in testing percentage*
Unaided mention, definite intention	36	41
Unaided mention, probable intention	23	33
Positive propensity, no unaided mention	7	12
Negative propensity	0	0

*Increase after controlling for demographic factors.

We conducted a corresponding analysis examining the percentage of respondents that took the operational ASVAB instead of the percentage that enlisted. We found very similar results, with the testing rate being much higher for each of the positive propensity groups than for the negative propensity group. As shown in the right column, the testing rate was 41 percentage points higher for the most positive group, unaided mention and definite intention, than for the negative propensity group, after controlling for demographic factors. Again, even the rate for the positive propensity, no unaided mention group was significantly higher than the testing rate for the negative propensity group, by some 12 percentage points. Thus, as the results of Charts 9 and 10 very clearly suggest, knowing the individual's enlistment intention afforded substantially better prediction of his eventual

enlistment decision or decision about taking the operational ASVAB than we could make based on his demographic characteristics in the YATS survey alone.

CHART 11

**EFFECT OF ENLISTMENT INTENTION ON ATTRITION
AND PROMOTION AMONG YATS ENLISTEES**
(COMBINED YATS SURVEYS, SPRING 1976-SPRING 1979)

- **No effect of enlistment intention on promotion**
- **Attrition rate lower for highest propensity group**

<u>Propensity group</u>	<u>Decrease in attrition percentage*</u>
Unaided mention, positive propensity	6
Positive propensity, no unaided mention	0
Negative propensity	0

*Decrease after controlling for demographic factors.

Because enlistment intention information adds to our ability to predict a YATS respondent's enlistment decision, we might also ask whether it helps us to predict his first-term performance if he enlists. To address this issue, we examined the significance of the intention information and various demographic characteristics shown earlier (Chart 8) in forecasting first-term attrition and promotion for the subset of YATS respondents who enlisted.⁷ We found no significant effect of enlistment intention level on promotion in the first term. Not surprisingly, our results showed that the most significant factor by far in first term promotions was time in service; in comparison with this factor, other variables were far less important.

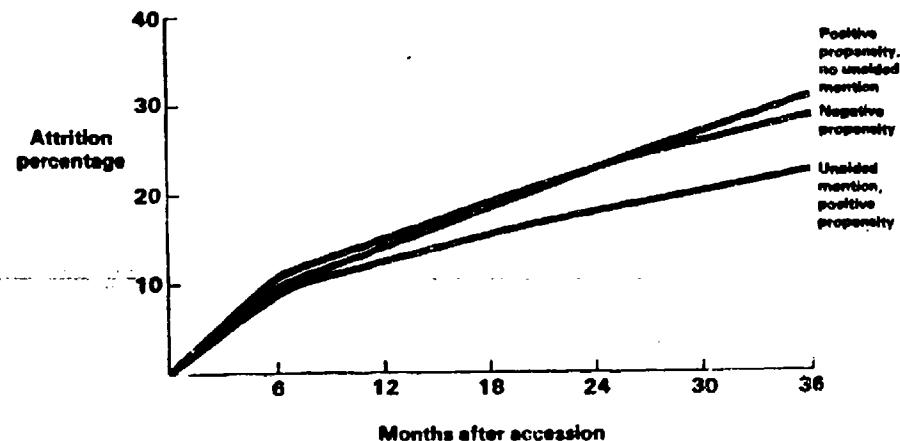
In looking at attrition in the first three years of service,

⁷Promotion was analyzed by regressing the highest pay grade attained by the respondent enlistee on the factors in Chart 8. Attrition in the first three years of service was regressed on the same factors for the attrition analysis.

however, we found that the attrition rate was significantly lower for the highest propensity group than for the negative propensity group. In this analysis, we combined the results for the top two intention groups shown earlier, i.e., the two unaided mention groups with either a definite or probable intention, because of their relatively small sizes when we restrict ourselves to the subset of YATS respondents who enlisted. The attrition rate in the first three years for this combined group was lower than that found for the negative propensity group by some six percentage points. This is not only a significant difference but a fairly large one, when we bear in mind that the mean attrition rate in this analysis was between 22 and 23 percent. Perhaps equally interesting is the absence of a significant difference between the negative propensity group and the other large group--the positive propensity, no unaided mention group--suggesting that the negative propensity group may be equally attractive for recruiting from the standpoint of nonattrition. Thus, the results for the YATS respondents suggest that the unaided mention variable may be the important propensity variable in attrition, and that there may be no difference in attrition for the two largest propensity groups.

CHART 12

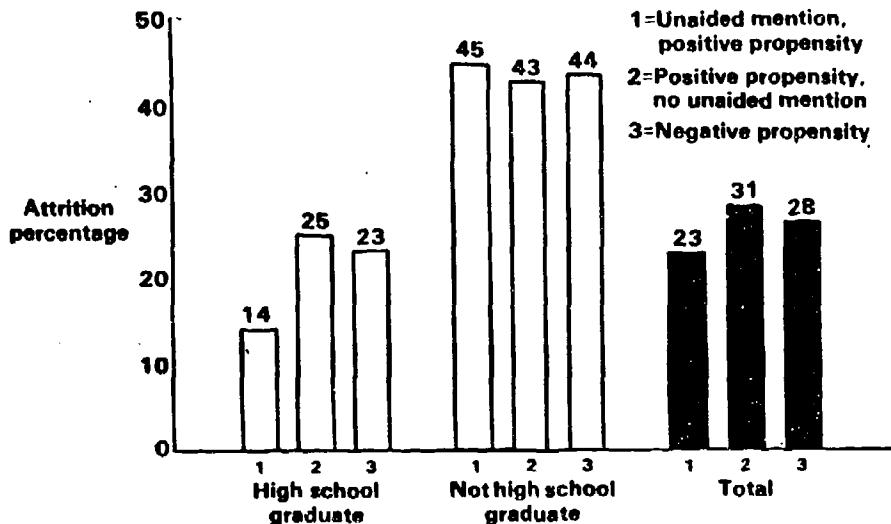
**ATTRITION RATES BY INTENTION
OVER TIME**
(COMBINED YATS SURVEYS, RESPONDENTS ACCESSING IN 1976-1979)



We can see the relationship we observed in the preceding chart in a somewhat different way. The results shown in Chart 12 indicate the total or cumulative attrition rate at six-month intervals following accession up to the three-year point. The results are shown separately for the three intention groups seen in Chart 11. Again, the attrition rate for the unaided mention, positive propensity group was lower than the rates for the two remaining groups. The rates for those groups were statistically equivalent.

CHART 13

THREE-YEAR ATTRITION RATE BY HIGH SCHOOL GRADUATION
STATUS AND ENLISTMENT INTENTION
(COMBINED YATS SURVEYS, RESPONDENTS ACCESSING IN 1976-1979)



We can also use the data to compare the influence of enlistment intentions with the influence of variables we would expect to strongly affect attrition. In particular, Chart 13 shows the attrition rates for high school graduates versus non-graduates, and compares the difference in attrition for these persons with the difference based on their enlistment intentions. Compare the heights of the first three bars versus those of the fourth to sixth bars. Note the large difference in attrition for the high school graduate versus non-graduate groups; the attrition rate for the YATS enlistees who did not graduate from high school was on average some 20 percentage points higher than that found for the high school graduates. The three bars on the far right show the attrition rate by intention level for the two school groups combined.

There is a difference of about 6 percentage points between the attrition rate for the unaided mention, positive propensity group, group 1, versus the rates for the two remaining groups. Thus, intention information significantly helps us predict attrition; high school graduation has a greater impact on the attrition rate among YATS enlistees, however. The data also suggest that the relationship between the intention measure and attrition may be complex; we observe the anticipated lower attrition rate for the unaided mention, positive propensity group among high school graduates, but find that the attrition rates for the three intention groups are essentially the same among non-graduates.

CHART 14

RESEARCH AGENDA

- ✓ • Compare enlistment intentions with enlistment decisions
 - Do intentions predict actions?
 - Which intention measures work best?
- ✓ • Investigate effects of enlistment intention information in analyses based on individual characteristics: enlistment, attrition, promotion
 - Identify possible uses of intention information in targeting potential recruits
 - Verify meaningfulness of relationships at individual level before performing aggregate analyses
- Develop methods of identifying quality of YATS respondents
 - Permit analysis of YATS results by quality level
 - Provide appropriate comparison group for forecasting high quality enlistments
- Assess contribution of enlistment intention results to aggregate enlistment forecasts

To summarize, in comparing the enlistment intentions and enlistment decisions of YATS respondents, we find that the intention measures predict their actual enlistment actions. We also find that knowing the enlistment intentions of YATS respondents allows us to better predict their enlistment decisions than we can on the basis of their demographic characteristics alone. For the subset of respondents who enlist, enlistment intention information from the YATS similarly improves prediction of attrition in the first three years of service. Thus, intention information can be a useful addition to demographic information in distinguishing the types of individuals who are likely to enlist from those needing more persuasion and in predicting success in the military among enlistees; it therefore may have possible applications in helping to target recruiting efforts or allocate

resources. We next turn to the two remaining areas of work this year: developing methods of identifying the quality of YATS respondents and assessing the potential contribution of enlistment intention results to aggregate enlistment forecasting.

CHART 15

**FACTORS USED IN ANALYZING AFQT SCORES
OF YATS RESPONDENTS**

(ASVAB EXAMINEES, COMBINED YATS SURVEYS SPRING 1976-FALL 1982)

- Age
- Education status
- Academic courses and GPA
- Father's education
- Race
- Geographic region

Our work in analyzing the AFQT scores of YATS respondents parallels work by Kyle Johnson at the Defense Data Manpower Center (DMDC) with respondents from the National Longitudinal Survey of Youth Labor Market Experience (NLS). We followed up respondents to the YATS survey and determined the actual AFQT percentile scores for those who took the operational ASVAB. We then attempted to model these AFQT scores based on demographic characteristics in the survey known to be related to AFQT percentile. These factors include the age of the respondent, his education status, the math and science courses he completed in high school and his self-reported grade point average, his father's education, his race, and his geographic region.

CHART 16

**RESULTS OF AFQT SCORE ANALYSIS FOR
YATS RESPONDENTS**

(ASVAB EXAMINEES, COMBINED YATS SURVEYS SPRING 1976-FALL 1982)

- AFQT score increases with:
 - Self-reported academic GPA
 - Math courses completed in high school
 - Father's education
- AFQT score lower for:
 - Respondents in racial minorities
 - Respondents in South
- Relationship of age to AFQT score depends on school status

Similar to results obtained for other data bases, we found that for YATS respondents AFQT percentile score increases with self-reported academic grade point average, the number of math courses completed in high school, and father's education. Also parallel to other results, AFQT scores were lower for respondents in racial minorities and respondents from the South. In the YATS data base, we found that the relationship between age and AFQT score depends on school status. The finding that the age-AFQT relationship is complex in the YATS is not surprising; the age variable represents age at the survey point rather than age at the testing point, as assessed elsewhere. The period between the survey point and testing point varies from one individual to the next.

CHART 17

**ACTUAL AFQT CATEGORY VERSUS
PREDICTED AFQT CATEGORY^a**
(ASVAB EXAMINEES, COMBINED YATS SURVEYS SPRING 1976-FALL 1982)

Predicted AFQT Category	Actual AFQT Category		Total
	1-3A	3B-5	
1-3A	37	15	52
3B-5	13	35	48
Total	50	50	100

^aPercent distribution based on actual AFQT scores of YATS respondents who took ASVAB and were high school graduates or were in high school at the time of the survey.

Using the results summarized in Chart 16, we can predict AFQT percentile score for a respondent and classify it as falling either in AFQT categories 1 to 3A or in categories 3B to 5.^b Similarly, we can take the actual AFQT score obtained by the respondent on the written test and categorize it as falling in categories 1 to 3A or 3B to 5. We then can compare his predicted or modelled AFQT category with his actual AFQT category.

The results indicate that the predicted score correctly classifies about three quarters of the respondents. Note that among the 50 percent of the respondents who actually scored in categories 1 to 3A, as shown in the first column of the chart, the predicted AFQT score fell in

^bCategories 1-3A contain AFQT scores in the 50th-99th percentiles; categories 3B-5 contain scores at or below the 49th percentile. The analysis excludes high school dropouts, since they cannot meet the services' "high quality" criteria, i.e., high school diploma graduates in AFQT categories 1-3A.

categories 1 to 3A for 37 of the 50 percent. Thus, on a relative basis, the classification was 74 percent correct. Similarly, note in the second column that among the 50 percent of the respondents who actually scored in categories 3B to 5, the model correctly placed 35 of the 50, or 70 percent, in categories 3B to 5. Thus, we find that the model correctly classifies some 70 to 75 percent of the respondents in their actual AFQT categories (i.e., in categories 1-3A versus 3B-5).

CHART 18

**ACTUAL AFQT CATEGORY VERSUS
PREDICTED AFQT CATEGORY***
(ASVAB EXAMINEES, COMBINED YATS SURVEYS SPRING 1976-FALL 1982)

Predicted AFQT Category	Actual AFQT Category		Total
	1-3A	3B-5	
1-3A	37	15	52
3B-5	13	35	48
Total	50	50	100

Predicted AFQT Category	Actual AFQT Category		Total
	1-3A	3B-5	
1-3A	25	11	36
3B-5	25	39	64
Total	50	50	100

*Percent distribution based on actual AFQT scores of YATS respondents who took ASVAB and were high school graduates or were in high school at the time of the survey

We can ask how the predicted AFQT score based on the new model compares with the score we would predict based on the quality index formerly used in the YATS. To make this comparison, we conducted a similar regression analysis using the respondent's quality index score (1 to 10) to predict his AFQT score.⁹ The results in the lower panel show quite clearly that the old measure does not do as good a job. Note, in particular, that whereas the newer model correctly classifies 37 of the 50 percent actually scoring in categories 1-3A, the model based on the former quality index classifies only 25 of the 50 percent correctly in categories 1-3A, misclassifying an equal number. Thus, the

⁹The quality index score is based on self-reported grade point average and the math and science courses completed in high school.

newer measure improves classification in the 1-3A categories from about 50 percent correct to about 70 percent. We plan to continue looking at the quality issue in the coming year, and hope to further improve the accuracy of quality assessment.

CHART 19

FACTORS USED IN ANALYZING AGGREGATE ENLISTMENT RATES

(MONTHLY HIGH QUALITY ENLISTMENTS IN 15 LARGEST STATES, 1976-1981)

- Within state factors
 - Average enlistment intention (YATS)
 - Position in business cycle
 - Ratio of military pay to civilian pay
- Number of recruiters
- Status of GI Bill
 - GI Bill versus post-GI Bill
 - transition months
 - CY 1977
- Month
- State

Using the results of the quality assessment, we computed the enlistment intentions of the subset of individuals the model indicated were high quality. We then combined this information with information on high quality enlistments developed by Robert Cotterman at Rand. His analysis forecasts monthly high quality enlistments in the 15 largest states.

The combined data base has several within state factors: the average enlistment intention as determined from the YATS; the position in the business cycle, a measure of the economy for that state; and the ratio of military pay to civilian pay, which indicates differences in civilian pay among different states. The model also includes terms for the numbers of recruiters for the different services over time and terms concerning the status of the GI Bill: whether there was a GI Bill in effect or whether a particular time is post-GI Bill; variables for the

transition months at the time the GI Bill was ended to detect any peculiar patterns of enlistments at the transition point; and a term for calendar year 1977, the first post-GI Bill year. Additional terms are included for the months of the year, to determine seasonal differences in enlistments, and for state, to control for differences in enlistment rates for the different areas.

CHART 20

RESULTS OF AGGREGATE ENLISTMENT ANALYSIS

(MONTHLY HIGH QUALITY ENLISTMENTS IN 15 LARGEST STATES, 1976-1981)

- **YATS enlistment intention data significantly related to concurrent aggregate enlistment rate**
- **Additional work needed to establish usefulness of aggregate enlistment intention information in forecasting enlistments**
 - Improve estimation of concurrent effects
 - Assess lagged effects

In examining the results of the aggregate analysis, it should be understood that the combination of the two data bases presents certain problems. For example, the YATS data base was not intended to be representative of intentions at the state level. Also, the two data bases cover somewhat different time periods. These limitations make it more difficult to observe the full extent of the relationship between intentions and enlistments at the aggregate level. The purpose here is not to present the final model of that relationship, however; rather, it is to learn whether adding enlistment intention information to a reasonable list of aggregate factors allows us to better explain regional enlistment rates.¹⁰

The results suggest that intention information may help improve aggregate forecasts. Despite the limitations noted above, we find evidence that regional YATS enlistment intention levels were

¹⁰For simplicity, the analysis combines results for the four services; it covers enlistments in June 1976-March 1981.

significantly related to the concurrent regional enlistment rates, after controlling for the other factors. Additional work is needed both to improve the estimation of concurrent effects and to assess the extent of any lagged effects of intentions on enlistments at the aggregate level. The question of lagged effects concerns whether knowing intentions at a particular time helps us forecast enlistments in the future.

CHART 21

CONCLUSIONS

- **Enlistment intention information may be helpful in targeting potential recruits**
 - Significant in predicting enlistment and attrition
 - Feasibility of using information must be determined
- **Quality level of YATS respondents can be determined statistically**
- **Usefulness of intention data in aggregate enlistment forecasts merits further examination**
 - Preliminary evidence of concurrent effects
 - Lagged effects must be assessed

We can draw several conclusions on the basis of the work undertaken this year. First, the results show that intention information allows us to better predict enlistments and attrition among YATS respondents than we can on the basis of their demographic data alone. In other words, knowing the strength of an individual's enlistment intention provides important additional information to what we know about him from his demographic characteristics. Thus, enlistment intention information may be helpful in recruiting efforts. Of course, before intention information could be applied in recruiting, the method of its application would require careful consideration. In the coming year, we will continue to examine the use of intention information in predicting enlistment and attrition.

Second, results on identifying the quality of YATS respondents are encouraging and suggest that quality level can be determined statistically in a meaningful way. The work completed allows us to

correctly classify some 70 to 75 percent of the individuals in AFQT categories 1-3A versus categories 3B-5. For categories 1-3A in particular, this compares to a match rate of only 50 percent using a model based on the former quality index. We plan to continue working on identifying the quality of YATS respondents, and anticipate further improvement of the results.

Finally, our preliminary assessment of the usefulness of intention information in aggregate enlistment forecasting has yielded encouraging results, and suggests this is an area that may merit further examination. We find evidence of concurrent effects: differences in the average enlistment intention levels across regions appear to help explain differences in the enlistment rates for these regions. As noted earlier, there are several limitations of the data bases we combined to conduct this assessment; thus, if feasible in the coming year, we will improve the data bases and conduct a more precise analysis. This will allow us to refine our estimates of concurrent effects and address the extent of any lagged effects of intentions on enlistments. The question of lagged effects is particularly important, determining whether knowing intentions at a given time may help us see future trends in enlistment rates. The extent of lagged effects also bears directly on the usefulness of intentions as an outcome measure in policy option tests where we might anticipate effects of the tests on intention levels prior to any effects on exam or enlistment rates.